S/133/61/000/012/004/006
A054/A127

The effect of the production technology on the....

as consumable electrodes. This method proved less efficient than electroslag remelting. The ingots subjected to this process have to be roughed before forging, in the same way as the conventional ingots, while this is not necessary for ingots remelted by the electroslag process. The chemical composition of EI847 steel after vacuum remelting only changed in such a way that some silicium, niobium and manganese cinder was formed, whereas after electroslag remelting there is some sulfur and silicium cinder. The silicium content decreased in the various heats by about 0.05 - 0.15%. The niobium-carbon ratio is at least 8 in the steel produced by the various methods tested and electroslag remelting. This ratio ensures a high resistance to intergranular corrosion when checked according to the AM(AM) method [ГОСТ 6032-58 (GOST 6032-58)]. As to nonmetallic inclusions the purest grade was obtained when smelting a fresh charge with rimming and deoxidizing with aluminum powder under white slag and by adding niobium in the form of a nickel-niobium master alloy or ferro-niobium with a low silicon content, followed by electroslag remelting. The amount of nonmetallic inclusions decreased in this way by a factor of 1.5 - 4. The technological ductility of EI847 steel increased when casting took place under the conditions described above. An additional reduction of the bath at the end of the refining period by metallic calcium increases the amount of brittle silicate

Card 3/4

The effect of the production technology on the .... $S/133/61/000/012/004/006$
A054/A127

and globular inclusions, but, at the same time also raises the steel ductility at high temperatures (this is contrary to the general opinion that inclusions lower the steel ductility). The highest degree of ductility in hot deformation (torsion) can be obtained in steel remelted with ANF-1P slag and a test slag containing 30% Al_2O_3, 30% CaO and 40% CaF_2. Vacuum-remelted steel is more ductile at 1,000 - 1,100°C than steel produced by electroslag remelting, at 1,150°C the ductility is about the same for both kinds of steel, while at higher temperatures the ductility of vacuum steels decreases and that of electroslag-remelted steels does not change up to 1,300°C. The electroslag remelting tests were carried out by S.A. Leybenzon, Engineer ("Dneprospetsstal'" Plant) and B. I. Medovar, Doctor of Technical Sciences, Yu.V. Latash, Candidate of Technical Sciences and B.I. Maksimovich, Engineer [Institut elektrosvarki im. Ye.O. Patona (Electric Welding Institute im. Ye.O. Paton)]. There are 5 figures, 4 tables and 3 Soviet-bloc references.

ASSOCIATION: Zavod "Elektrostal'" ("Elektrostal'" Plant)

Card 4/4

ZUYEV, M.I.; KULTYGIN, V.S.; KABLUKOVSKIY, A.F.; SIMONOV, V.I.; ZUYEV, T.I.;
VOROB'YEV, Yu.K.; MARTYNUSHKIN, A.M.; TSUKANOV, V.P.; LAKTIONOV, V.S.

Improved technology of the smelting of ShKh-15 steel for ball
bearings. Prom.energ. 17 no.2:12 F '62.   (MIRA 15:3)
(Steel--Metallurgy) (Ball bearings)

VOROB'YEV. Yu I

VOROB'YEV, Yu.I.; GORBUSHINA, P.M.

Radiation osteonecrosis of the jaws. Stomatologiia 37 no.1:39-42
Ja-F '58.
(MIRA 11:3)

1. Iz kafedry khirurgicheskoy stomatologii (zav. - prof. A.I.
Yevdokimov) i kafedry rentgenologii i radiologii (zav. - prof.
I.A.Shekhter) Moskovskogo meditsinskogo stomatologicheskogo instituta
(dir. - dotsent G.N.Beletskiy)
        (JAWS--DISEASES)   (RADIOACTIVITY--PHYSIOLOGICAL EFFECT)

VOROB'YEV, YU.K.

S/130/60/000/009/003/004
A006/A002

AUTHORS: Kablukovskiy, A.F., Simonov, V.I., Zuyev, T.I., Vorob'yev, Yu.K.

TITLE: Intensified Melting in Arc Furnaces

PERIODICAL: Metallurg, 1960, No. 9, pp. 19 - 20

TEXT: When melting ШХ15 (ShKh15) ball bearing steel in electric arc fur-
naces at the "Elektrostal'" Plant, diffusion deoxidation during the reduction
period and holding of the metal under carbide slag takes not less than one hour.
Ferrochromium is added to the deoxidized metal 40 minutes after the onset of
refining. The carbide slag is converted into white slag 10-15 minutes prior to
teeming, and ferrosilicide lumps are supplied to the furnace. Prior to teeming
the metal into the ladle, it is deoxidized with aluminum lumps (0.4 kg/ton). The
total refining time is 1 hour 40 min - 2 hours 10 min. A new method was developed
to raise the efficiency of 20-ton arc furnaces when melting ShKh15 steel without
impairing the quality of the metal. This technology differs from the conventional
method as follows: a) partial dephosphorization and melting of the charge are com-
bined by adding lime and ore to the pool at the end of the melting period; b) suf-
ficient degassing of the metal is ensured by a reduced carbon content at the be-

Card 1/2   (1)

Intensified Melting in Arc Furnaces   S/130/60/000/009/003/004
                                        A006/A002

ginning of the oxidizing period and by removing not less than 0.30% carbon during bubbling; c) the metal is preliminary deoxidized at the end of the oxidizing period with refined cast iron containing 4.0 - 4.5% C, 8.0- 0.0% Mn and not over 0.030% P in an amount of 7.5-12.5 kg/t; d) additional deoxidizing of the metal prior to the formation of reducing slag with silico-chromium lumps (5.0-6.0 kg/ton) and aluminum (0.4 kg/ton); e) addition of the main portion of ferrochromium to the bare metal without preliminary diffusion deoxidation; f) deoxidation of the slag with coke powder and 75% ferrosilicide and final deoxidation of the metal with aluminum lumps (0.5 kg/ton) prior to teeming; g) the total reducing time is 60-70 min. The contamination of the metal in both cases was almost equal. The melting time with a fresh charge was reduced by 48 min; in remelting of waste it was reduced by 33 min i.e. by 15-19%. The average economy in electric power was 47 kwh/ton in remelting and 75 kwh/ton on a fresh charge. Presently the method is used for melting 12XH3A (12KhN3A), 18XHBA (18KhNVA), 40X (40Kh), 9X BГ (EKhVG), 60C2A (60S2A) and other structural and instrument steels at the Elektrostal' Plant. A table is given containing technical and economical data of experimental and conventional melts.

ASSOCIATION: "Elektrostal'" zavod (Elektrostal' Plant)

Card 2/2

VOROB'YEV, Yu.K.; SIMONOV, V.I.

Intensifying the manufacture of structural and tool steels.
Metallurg 8 no.7:15-17 Jl '63.   (MIRA 16:8)

1. Zavod "Elektrostal'."
          (Steel, Structural--Electrometallurgy)
            (Tool steel--Electrometallurgy)

VOROB'YE$, YU. L.

Cand Tec Sci, Diss -- "Investigation of wastes from asbestos benefici-
ating plants and obtaining concretes and binders on their base".
Khar'kov, 1961. 17 pp, 20 cm (Min of Higher and Inter Spec Educ UkrSSR.
Khar'kov Auto-Highwy Inst), 180 copies, No charge (KL, No 9, 1961, p 181,
No 24330). /61-54093/

PELIKHOV,.G.V., inzh.; VOROB'YEV, Yu.L., inzh.; MCHEDLOV-PETROSYAN, O.P.,
doktor tekhn.nauk
Improving the quality of clay bricks manufactured by the "Stroikera-
mika" Plant. Sbor. trud. IUAHNII no.2:84-91 '59.   (MIRA 13:9)

1. Khar'kovskiy institut inzhenerov zhelezno-dorozhnogo transporta
imeni S.M.Kirova.
                 (Kharkov-- Brickmaking)

GULIYEV, Yu.M.; VOROB'YEV, Yu.L., inzh.

Experimental investigation of additional resistance during the propulsion of ship models in waves. Sudorem. i sudostr. no.2: 77-90 '63.

(MIRA 17:4)

1. Odesskiy institut inzhenerov morskogo flota (for Vorob'yev).

GULIYEV, Yu.M.; VOROB'YEV, Yu.L.

Experimental investigation of changes in the trim of a ship
in the propulsion of ship models. Sudorom. i sudostr. no.2:
71-76 '63.   (MIRA 17:4)

1. Odesskiy institut inzhenerov morskogo flota (for Vorob'yev).

L 04558-67

ACC NR: AP6023947   (N)   SOURCE CODE: UR/0233/65/000/006/0039/0045

AUTHOR: Vorob'yev, Yu. L.

ORG: none

TITLE: Method of calculating the integral of the wave resistance of a vessel moving in deep and in shallow water

SOURCE: AN AzerbSSR. Izv. Ser fiz-tekhn i matem n, no. 6, 1965, 39-45

TOPIC TAGS: hydraulic resistance, inland vessel data, merchant vessel data, integration, Bessel function, computer programming

ABSTRACT: In view of the fact that the standard formulas given for the wave resistance are too complicated for use for real vessels and are not sufficiently accurate, the author modifies the integral equation derived for the wave resistance by N. Ye. Kochin (Collected works, vol II, AN SSSR, 1949) to a form more convenient for calculation. This is done by going over from integration over the surface to integration over the diametral plane and using contour integration and approximations for the Bessel functions involved in the calculations. The result is a set of equations that is suitable for computer programming. It is shown further that the wave resistance in shallow water can be represented as the sum of the wave resistance of the same vessel in deep water and a correction which takes into account the limited depth of the fairway. Orig. art. has: 49 formulas and 3 figures.

SUB CODE: 13/   SUBM DATE: 00/   ORIG REF: 004/   OTH REF: 001

Card   1/1

L 32894-66   EWT(m)/EWP(j)/I   RM/WW   SOURCE CODE: UR/0081/66/000/001/M019/M019

ACC NR: AR6023808

AUTHOR: Vorob'yev, Yu. L.; Kostryukov, V. V.; Krymov, O. I.; Savina, G. G.

ORG: none

TITLE: Corrosion resistance of cements for reinforced concrete shipbuilding

SOURCE: Ref. zh Khimiya (pt. 2), Abs. 1M204

REF SOURCE: Tr. Khar'kovsk. in-ta inzh. zh. d. transp., 1965, vyp. 73, 65-72

TOPIC TAGS: reinforced concrete, cement, corrosion resistance/RVVBRB cement

ABSTRACT: The resistance of Sebryakovskii sulfate-resistant portland cement containing 77.3% $3CaO \cdot SiO_2$ and $2CaO \cdot SiO_2$ and 5.8% $3CaO \cdot Al_2O_3$ and the same cement containing 2% $CaCl_2$ and 2% $Al_2(SO_4)_3$ as additions was tested in sea water. The addns. helped expansion and rapid hardening of the concretes and mortars and led to filling of pores in the concrete (cement RVVBRB). The order of preparation, storage, and testing of the samples, and the characteristics of the corrosive liquids (synthetic Black Sea and Caspian Sea waters) are described in detail. The concentration of the solns. was 2 and 3 times the natural concentrations. The corrosion resistance was evaluated from the coefficient KC_8 which is equal to the ratio or R_{iz} of the test and control specimens at 8 months age. Cement RVVBRB had a high corrosion resistance

Card 1/2

L 32894-66

ACC NR: AR6023808   /

in Black and Caspian Sea waters. Sulfate-resistant portland cement showed a tendency toward a steady decrease in R (especially in Caspian Sea water) while RVTsBBP cement had a tendency to increase in strength after the drop in R. /JPRS/

SUB CODE: 11, 20 / SUBM DATE: none

Card 2/2

L 16520-66 EWT(1)/EWP(m)/EPF(n)-2/EWA(d)/ETC(m)-6 WW

ACC NR: AP6002626 (N) SOURCE CODE: UR/0258/65/005/006/1109/1111

AUTHOR: Vorob'yev, Yu. L.   53

ORG: none β
                          $1,55$

TITLE: On calculation of wave resistance of ships

SOURCE: Inzhenernyy zhurnal, v. 5, no. 6, 1965, 1109-1111

TOPIC TAGS: ship, hydrodynamics, approximation method, wave impedance

ABSTRACT: Two quadratic functionals are given for calculating the wave impedance
of ships in channels of infinite depth (R_w) and in channels of finite (R_{wh})
depth h. For the latter, the expression for the wave impedance can be given

$$R_{wh} = -\frac{\rho v^2}{\pi} \int_0^{\pi/2} (I_1^2 + I_2^2) \frac{\mathrm{th}\, k_0 h}{\mathrm{ch}^2\, k_0 h \cos^2\theta - vh} \frac{d\theta}{\cos\theta},$$

$$\begin{Bmatrix} I_1 \\ I_2 \end{Bmatrix} = \int_S \mathrm{ch}\,[k_0(h-z)] \begin{Bmatrix} \cos \\ \sin \end{Bmatrix} (k_0 x \cos\theta) \cos(k_0 y \sin\theta)\, q(x,z,h)\, ds,$$

Card 1/2   UDC: 532.583.4

L 16520-66

ACC NR: AP6002626

It is then shown that the integrals I_1 and I_2 can be evaluated if

$$q(x, z) = V \cos(n, \hat{z})$$

is assumed. This analysis yields a sum of individual wave impedances for the ship. In particular, R_{wh} is found to be the same as R_w with an additional correction term to account for the finite water depth. Orig. art. has: 17 equations.

SUB CODE: 20/ 13/ SUBM DATE: 02Feb65/ ORIG REF: 002

Card 2/2

ACC NR: AT7004008 (N) SOURCE CODE: UR/3239/66/000/002/0015/0019

AUTHOR: Vorob'yev, Yu. L.

ORG: None

TITLE: On a singularity of the integral of wave resistance

SOURCE: Nikolayev. Korablestroitel'nyy institut. Sudostroyeniye i morskiye sooruzheniya, no. 2, 1966. Sudostroyeniye (Shipbuilding), 15-19

TOPIC TAGS: wave mechanics, hydrodynamic theory, ship, integral equation

ABSTRACT: The author considers wave resistance defined as:

$$R_w = -\frac{\rho v_2}{\pi} \int_0^{\frac{\pi}{2}} (J_1^2 + J_2^2) \frac{d\theta}{\cos^3\theta},\qquad (1)$$

where

$$\begin{Bmatrix} J_1 \\ J_2 \end{Bmatrix} = \int_S \exp\left(-\frac{vz}{\cos^2\theta}\right) \begin{Bmatrix} \cos\left(\frac{vx}{\cos\theta}\right) \\ \sin\left(\frac{vx}{\cos\theta}\right) \end{Bmatrix} \cos\left(\frac{v y \sin\theta}{\cos^2\theta}\right) q(x, y, z)\, dS,\qquad (2)$$

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ACC NR: AT7004008

ρ is the density of the liquid, $\nu = g/V^2$, V is the velocity of the ship, g is the acceleration due to gravity, S is the wetted surface of the hull, $q(x\ y\ z)$ is the density of sources continuously distributed over surface S. Changing the order of integration and making the substitution $\sec\theta = \operatorname{ch} u/2$ gives

$$R_w = -\frac{\rho \nu^2}{4\pi} \iint\limits_{S\,S} q(x, y, z)\, q(\xi, \eta, \zeta)\, F(a, b, c, d)\, dS\, dS, \qquad (3)$$

where

$$F(a, b, c, d) = E_1(a, b, c) + E_2(a, b, d),$$

$$\begin{matrix} E_1 \\ E_2 \end{matrix} = \int_0^\infty \exp\left(-a\,\operatorname{ch}^2\frac{u}{2}\right)\cos\left(b\,\operatorname{ch}\frac{u}{2}\right)\cos\begin{Bmatrix}c\,\operatorname{sh}u \\ d\,\operatorname{sh}u\end{Bmatrix}\operatorname{ch}^2\frac{u}{2}\,du, \qquad (4)$$

$$a = \nu(z + \zeta), \quad b = \nu(x - \xi), \quad c = \frac{1}{2}\nu(y - \eta), \quad d = \frac{1}{2}\nu(y + \eta).$$

This equation may be transformed so that integration is done with respect to the diametric plane of the ship S_0 instead of with respect to the surface S:

$$R_w = -\frac{\rho g \nu}{\pi}\int\limits_{l}^{\frac{L}{2}}\int\limits_{-\frac{L}{2}}^{\frac{L}{2}}\int_0^T\int_0^T \chi(x, y, z)\frac{\partial y}{\partial x}\chi(\xi, \eta, \zeta)\frac{\partial \eta}{\partial \xi}F(a, b, c, d)\,d\zeta\,dz\,d\xi\,dx, \qquad (5)$$

Card 2/3

ACC NR: AT7004008

Here $y=f(x, z)$ is the equation of the wetted surface of the hull, $\chi(x, y, z)$ is the coefficient of density of the sources distributed over surface S, L is the length of the ship and T is its draft. It is shown that the functions E_1 and E_2 are integrable with respect to the diametric plane of a ship on the free surface of the liquid, and thus that formulas (3)-(5) are applicable to calculation of the wave resistance of a surface vessel. Orig. art. has: 1 figure, 16 formulas.

SUB CODE: 20/ SUBM DATE: None/ ORIG REF: 002
/3/

Card 3/3

VOROB'YEV, Yu.P.; BOGOSLOVSKIY, V.N.; BOGACHOVA, Ye.G.; CHUFAROV, G.I.

Reduction of $FeV_{0,6}Fe_{1,4}O_4$ solid solution under equilibrium
conditions. Dokl. AN SSSR 166 no.3:664-667 Ja '66.

(MIRA 19:1)

1. Institut metallurgii, Sverdlovsk. 2. Chlen-korrespondent
AN SSSR (for Chufarov). Submitted June 29, 1965.

FILIPPOV, A.P.; VOROB'YEV, Yu.S.

Free fending and torsional bibrations of naturally twisted blades
of turbomachines. Sbor.trud.Lab.gidr.mash.AN URSR no.10:3-18 '62.
(MIRA 15:12)

(Turbomachines—Blades—Vibration)

VOROBYEV, Yu.S.; FILIPPOV, A.P. (Khar'kov)

"Free vibrations of rotating bars without the hypothesis of plane sections"

report presented at the 2nd All-Union Congress on Theoretical and Applied Mechanics, Moscow, 29 January - 5 February 1964

ACC NR: AR6028089   SOURCE CODE: UR/0124/66/000/005/V069/V069

AUTHOR: Vorob'yev, Yu. S.

TITLE: Bending of a rod with consideration of warping of the cross section under shear and torsion

SOURCE: Ref. zh. Mekhanika, Abs. 5V535

REF SOURCE: Dinamika i prochnost' mashin. Resp. mezhved.: nauchno-tekhn. sb., vyp. 1, 1965, 125-131

TOPIC TAGS: bending strength, warping, shear stress, torsion stress, rod

ABSTRACT: The function of torsion and warping from shear during bending of a prismatic rod by a transverse load is sought on the basis of the Lagrange variational principle. An approximate solution is obtained, however, in the particular case of an overhanging rod loaded by a concentrated force the final formulas agree with the well-known solution of Saint Venant. The author, assuming warping from shear, finds the form factor of the cross section under shear. Formulas are also derived which determine the position of the center of bending of a rod with an arbitrary cross section. The effect of the initial curvature of the rod on the position of the center of bending is examined. [Translation of abstract] V. V. Meshcheryakov

SUB CODE: 20,13

Card 1/1

VOROB'YEV, *Yu. V.*

Mar/Apr 49

USSR/Electronics
    Regulators, Electronic
    Voltage Regulators

"Methods of Investigating the Stability of Regulat-
ing Systems With Distributed Parameters," Yu. V.
Vorob'yev, V. N. Drezdovich, Leningrad Ord of
Lenin Metal Plant imeni Stalin, 6½ pp

"Avtomat i Telemekh" Vol X, No 2

Attempts to compare various methods of investigat-
ing stability of regulating systems with distrib-
uted parameters from the standpoint of their
practical application. Indicates several new re-
sults in this field.

41/49T26

VOROB'YEV, YU. V.

USSR/Electronics
Regulators, Electronic
Mathematics, Applied

Jul/Aug 48

"Studies on the Stability of One Class of Automatic Regulating Systems Having Wave Processes in the Various Links," Yu. V. Vorob'yev, Leningrad Order of Lenin Metal Factory imeni Stalin, 5 pp

"Avtomatika i Telemekh" Vol IX, No 4

Examines the equation $f(z;\mu) = 0$. Shows how to determine the number of roots with the positive real component of the function $f(z;\mu)$ when $\mu = \mu_1$, if the number of these roots is known when $\mu = \mu_0$. It is

13/49T24

USSR/Electronics (Contd)   Jul/Aug 48

also assumed that the purely imaginary roots, if they exist, are known for $\mu = \mu_0$ e;d;$\mu = \mu_1$. As an example, Gurvits' problem is solv;d for an equation of the form $P(\lambda)ch\lambda + Q(\lambda)sh\lambda = 0$, where $P(\lambda)$ and $Q(\lambda)$ are polynomials. Submitted 17 Feb 1948

13/49T24

VOROB'YEV, Yu.V.

Contacts of cylindrical bodies. Uch.zap.Len.un.no.114:189-199 '49.
(MIRA 10:3)

(Elastic solids)

VOROB'YEV, YU. V.

33890. O Soprikasanii, Tsilindrichyeskikh Tyel. Uchsn. Zapiski. (Lyeningr. Gos. Un-t
Im. Zhdanova), Syeriya Fatyem. Nauk VYP. 17, 1949, C.189-99

SO: Letopis' Zhurnal'nykh Statey, Vol. 46, Moskva, 1949.

VORCB'YEV, Yu. V.

USSR/Mathematics - Electron Optics   Jul 52

"Method of Numerical Integration of a Type of Equa-
tions of Mathematical Physics and Its Application
to Problems of Electron Optics," Yu. V. Vorob'yev

"Zhur Tekh Fiz" Vol XXII, No 7, pp 1166-1173

Analyzes the case in which the coeffs of a linear
differential eq of 2d order are given numerically
in a table. This method is applied to solns,
contg singularities of familiar type. The applica-
tion of this method to soln of paraxial optics of
elec immersion lenses is outlined. Received
2 Oct 51.

223T86

VOROB'YEV, Yu.V.

SUBJECT   USSR/MATHEMATICS/Functional analysis   CARD 1/2   PG - 477
AUTHOR   VOROB'EV Ju.V.
TITLE   Moment theory for non-selfadjoint linear operators.
PERIODICAL   Uspechi mat.Nauk 11, 2, 161-167 (1956)
             reviewed 1/1957

The present paper is a generalization of earlier publications of the author
(Uspechi mat.Nauk 9, 1, 83-90; ibid. 10, 1, 89-96). Let the linear bounded
operator A be defined in the whole Hilbert space. Let z_0 be an element of A.

Let be given the following sequence:

$$z_0, \ z_1 = Az_0 \ , \quad z_2 = A^2 z_0, \ldots, z_n = A^n z_0 \ , \ldots \ .$$

Let H_n be the linear closure of $z_0, z_1, \ldots, z_{n-1}$. Let $\overline{z_n}$ be the projection of
z_n into H_n. A sequence of the operators B_n is defined by

$$z_k = B_n^k z_0 \qquad \overline{z_n} = B_n^n z_0 \qquad (k=0,1,\ldots,n+1).$$

By this the operator B_n in H_n is determined uniquely. Let λ be an eigenvalue
and u an eigenelement of B_n: $B_n u = \lambda u$. The eigenvalues of B_n are roots of
the determinant of the homogeneous system

$$
(1) \quad
\begin{cases}
-\alpha_n \, \xi_{n-1} = \lambda \xi_0 \\
\xi_0 \; -\alpha_{n-1} \xi_{n-1} = \lambda \xi_1 \\
\text{-----------------------} \\
\xi_{n-2} - \alpha_1 \; \xi_{n-1} = \lambda \xi_{n-1}
\end{cases}
$$

where the α_i are the components of $\overline{-z_n}$ in H_n. The components of n result from
(1) for $\xi_{n-1} = 1$. The operators B_n approximate the operator A and in many
cases A can be replaced by B_n. For $n \to \infty$, B_n converges strongly to A. If $f(\lambda)$
is a holomorphic function in the circle with the radius $R > \|A\|$, then the
sequence $f(B_n)$ converges strongly to $f(A)$ in H_z.

Let be given the equation $x = Ax + f$ ($\|A\| = q < 1$). The solution $x_* = (E-A)^{-1} f$ can be
determined approximatively by putting $z_0 = f$, $z_1 = Af, \ldots$ and constructing the

sequence B_n. Since $\dfrac{1}{1-\lambda}$ is holomorphic in the unit circle and $\|A\| < 1$,

$x_n = (E-B_n)^{-1} f$ converges strongly to x_*. Some further possibilities of application
are discussed.

SOV/124-58-5-4977

Translation from: Referativnyy zhurnal, Mekhanika, 1958, Nr 5, p 6 (USSR)

AUTHOR   Vorob'yev, Yu.V.

TITLE: The Moment Method in a Linear-system Vibration Problem
            (Metod momentov v zadache o kolebaniyakh lineynykh sistem)

PERIODICAL   Vychislit. matematika, 1957, Nr 1, pp 23-33

ABSTRACT.   An examination is made of the problem of integrating a
             system of ordinary high-order linear differential equations
             having constant coefficients, where algebraic methods have
             proved ineffective. Examined also, in this connection, is the
             problem of approximating a given system of equations by re-
             placing it with another system, similar but of a lower order.
             Considered is the equation

$$\frac{\partial x}{\partial t} = Ax + gf(t) \tag{1}$$

             wherein gf(t) is the driving force and A is a finite linear oper-
             ator determined for the entire Hilbert space H. To solve equa-
             tion (1), use is made of the method of moments, expounded by

Card 1/3   the author previously [Uspekhi matem. nauk, 1954, Vol 9, Nr 1,

The Moment Method in a Linear-system Vibration Problem

(59)]. According to this method a series of iterations

$$z_0 = g, \quad z_1 = A z_0, \ldots, \quad z_n = A^n z_0, \ldots$$

is set up, whereupon equation (1) is replaced by the equation

$$\frac{\partial x_n}{\partial t} = B_n x_n + g f(t) \tag{2}$$

which approximates it. A solution to (2) is sought in the form of the series

$$x_n = \eta_0(t) z_0 + \eta_1(t) z_1 + \ldots + \eta_{n-1}(t) z_{n-1} \tag{3}$$

Substituting (3) in (2) and adjusting the coefficients of z_i, the author obtains a system of equations equivalent to the operator equation (2)

$$\partial \eta_0 / \partial t + a_n \eta_{n-1} = f(t)$$

$$\partial \eta_1 / \partial t - \eta_0 + a_{n-1} \eta_{n-1} = 0$$

Card 2/3   . . . .

SOV/124-58-5-4977

The Moment Method in a Linear-system Vibration Problem

$$\partial \eta_{n-1}/\partial t - \eta_{n-2} + a_1 \eta_{n-1} = 0$$

The system obtained is readily solved by means of the Laplace transformation, since it is usually possible to replace system (1) by the lower-order system (4). This substitution is accompanied by an estimate of the magnitude of the error, which is shown to be small if some of the natural vibrations are only weakly excited.

Yu.A. Mitropol'skiy

1. Vibrations—Mathematical analysis

Card 3/3

16(1)   PHASE I BOOK EXPLOITATION   SOV/2600

Vorob'yev, Yuriy Vasil'yevich

Metod momentov v prikladnoy matematike   (Method of Moments in
    Applied Mathematics) Moscow, Fizmatgiz, 1958. 186 p. (Series:
    Biblioteka prikladnogo analiza i vychislitel'noy matematiki)
    7,000 copies printed.

Ed.: S.B. Norkin; Tech. Ed.: K.F. Brudno.

PURPOSE: This book is intended for scientific workers and Aspirants
    in the fields of applied mathematics, physics and engineering,
    and also for students taking advanced courses in the above
    fields.

COVERAGE: The book presents the theory of the application of the
    method of moments for the approximate determination of the
    eigenvalues of linear operators and solution of linear equations.
    This theory is illustrated by a series of concrete examples.
    Of the many kinds of iterative methods used in mechanics,

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physics and engineering, the book discusses only one class of
method, constructed on the variational principle and closely
connected with the classical Chebyshev-Markov problem of moments.
These methods are noted both for the wide circle of problems
to which they can be applied and for the rapid convergence of the
successive approximations. The general statement of the problem
and use of the devices of functional analysis allow all the methods
of the class under study to be connected with the single method
of moments. In order to facilitate reading the book, some of
the terminology and fundamental results of the theory of operators
in Hilbert space have been included. However, for better under-
standing of some chapters, a knowledge of the spectral theory
of self-adjoint operators and the theory of unbounded operators
is necessary. The author acknowledges the help he received from
L.A. Lusternik in preparing the book. There are 33 references: 19
Soviet, 6 English, 4 German, and 4 French.

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Card 5/5   11-30-59

YU.VVOROB'YEV

VOROB'YEV, Yu. V.

SUBJECT	USSR / PHYSICS
AUTHOR	VOROB'EV, JU. V.
TITLE	The Powder Patterns in Electrostatic Immersion Lines.
PERIODICAL	Zurn. techn. fis, 26, fasc.10, 2269-2280 (1956)
	Issued: 11 / 1956

CARD 1 / 2   PA - 1671

The theory of aberration of the third order, which, in analogy with light
optics, was extended to electron optics, is quite inadequate for the determi-
nation of powder patterns (which are obtained in the image plane) and of the
resolving power of immersion lines. The present work investigates this problem.
The trajectories of electrons and the powder patterns in the neighborhood of
the symmetry axis of the lens: The results obtained here are not new. The
present discussion serves the purpose of illustrating the method and complet-
ing knowledge concerning the powder patterns. With the usual method for the
determination of aberration the solution of the nonlinear trajectory equation
is set up in form of a series according to the powers of small parameters. As
such parameters the emission height and the tangent of the angle of inclina-
tion of the trajectory at the point of emission are chosen. In the course of
the present work the following parameters of development are suggested:
Emission height and initial velocity of the electrons which leave the cathode.
The first terms of the development, which are different from zero in the image
plane, are here called "boundary aberrations". The equations of motion of the
electrons emitted from the center of the cathode (in an axial-symmetric
electrostatic field) are given in cylindrical coordinates and are transformed

Zurn.techn.fis,26,fasc.10, 2269-2280 (1956) CARD 2 / 2   PA - 1671

accordingly. Here the following development of the potential in the neighbor-
hood of the axis is used: $\varphi(z,r) = \phi(z) - (1/4) \phi''(z)r^2 + \dots$; here $\phi(z)$
denotes the potential on the axis. The differential equations for the determi-
nation of the terms in series developments are given and their integration is
discussed. After determination of the necessary terms, an explicit expression
for the trajectory of the electron is obtained. With its help it is easily
possible to determine the position of the image and the powder pattern in the
center of the image.

An expression for the errors committed when measuring colors in the longi-
tudinal direction is given. The chromatic aberration increases the dispersion
area by the $\sqrt{2}$-fold and reduces re-solution correspondingly. Finally, a
formula for the dependence of the enlargement of the system on the connected
potential difference is given. It is now possible to examine the <u>powder</u>
<u>pattern</u> which is formed by an electron bundle emitted from any point of the
cathode. For this purpose it is above all necessary to determine the tra-
jectories of the electrons which form the bundle. At first formulae for the
transversal errors are given. Next, the total powder pattern is investigated,
which is an ellipse. In conclusion the powder pattern is computed with the
help of the aberration coefficients of the third order.

INSTITUTION:

AUTHOR: Vorob'yev, Yu. V.   SOV/20-120-4-17/67

TITLE: On the Possibility of Increasing the Resolving Power of an
            Emission Microscope by Means of an Electron Mirror (O voz-
            mozhnosti povysheniya razreshayushchey sposobnosti emission-
            nogo mikroskopa s pomoshch'yu elektronnogo zerkala)

PERIODICAL: Doklady Akademii nauk SSSR, 1958, Vol. 120, Nr 4, pp.751-752
            (USSR)

ABSTRACT: The present paper shows that by means of an electron mirror
            which is used as a filter the resolving power of an emission
            microscope can be increased considerably. The author in-
            vestigates an emission microscope to which, after the pro-
            jection lens, a plane electron mirror is fitted (which pro-
            jects the image on to a screen). The optical scheme of such
            a device is illustrated by a drawing. When calculating the
            resolving power, the author deals solely with the case of
            the thermocathode. The electron beams have a very small
            aperture, and therefore the aberration of the electron mirror
            itself can be disregarded. For the circle of diffusion of
Card 1/2   the emission system an expression is written down. The cal-

SOV/2o-12o-4-17/67

On the Possibility of Increasing the Resolving Power of an Emission Micro-
scope by Means of an Electron Mirror

culated dependence of the resolving power on the potential
of the mirror is shown by a diagram. An example, which is
mentioned and described in short, shows that it was possible
to increase the resolving power by the seven-fold. There
are 2 figures and 1 reference, 1 of which is Soviet.

PRESENTED: March 7, 1958, by A. A. Lebedev, Member, Academy of Sciences,
              USSR

SUBMITTED: February 26, 1958

1. Electron optics--Theory   2. Mirrors--Materials   3. Electron
microscopes--Equipment   4. Electron microscopes--Performance

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SOV/155-58-6-4/36

AUTHOR: Vorob'yev, Yu.V.

TITLE: Theory of the Potential for Equations in Terminal Differences

PERIODICAL: Nauchnyye doklady vysshey shkoly. Fiziko-matematicheskiye nauki,
1959, Nr 6, pp 19-24 (USSR)

ABSTRACT: In the usual solution of difference equations under re-
duction of the step the extent of calculation (number of
unknowns) is increased and the velocity of convergence is
deteriorated. In order to obtain easier equations the author
proposes to extend the classical potential theory to difference
equations. He explains the method by the example of the plane
Dirichlet problem with a quadratic net. The author introduces
analogies for the potentials of the simple and double layer
and seeks the solution as a potential. When reducing the step
the decisive equations change over into the integral equations
of potential theory.

ASSOCIATION: Gosudarstvennyy ordena Lenina optichoskiy institut imeni S.I.
Vavilova (State "Order of Lenin" Optical Institute imeni
S. I. Vavilov).

SUBMITTED: April 26, 1957 (Uspekhi matematicheskikh nauk)
October 24, 1958 (Nauchnyye doklady vysshey shkoly. Fiziko-
matematicheskiye nauki)

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SOV/48-23-4-12/21

AUTHORS: Vertsner, V. N., Ivanov, M. G.,
Kozelkin, V. V., Bogdanovskiy, G. A., Vorob'yev, Yu. V.,
Klyukin, V. Ye., Nikiforova, V. A., Chentsov, Yu. V.

TITLE: The Series Electron Microscope EM-5 (Seriynyy elektronnyy mikroskop EM-5)

PERIODICAL: Izvestiya Akademii nauk SSSR, Seriya fizicheskaya, 1959,
Vol 23, Nr 4, pp 485 - 489 (USSR)

ABSTRACT: The electron microscope EM-5 is a high-resolution instrument (Fig 1).
The principal elements are arranged vertically and the image screen
exhibits high resolution. There is a camera, and various adjusting
facilities allow good working conditions. In the object, the part
hit by the electron beam has a diameter of 7-5 μ.
The object is situated on an object slide, which is movable from
outside. The object lens and its stigmator consisting of eight
coils are accurately described, as well as the intermediate and
projecting lens. The diffraction mount allows electronography with
penetrating and reflected beam. The camera works with plate
dimensions of 4.5·6 cm and 4.5·3 cm. The instrument features a
special vacuum system. Acceleration takes place by the voltage
steps 40, 50, and 60 kv. The current source is stabilized, its

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The Series Electron Microscope EM-5   SOV/48-23-4-12/21

fluctuation amounting to 0.003%. The electrical supplies are
discussed. The electron microscope EM-5 allows a bright and dark
field illumination, stereoscopic investigations, microdiffraction
images, dark field investigations of the diffraction reflexes, etc.
On focusing, the image screen is observed through a binocular
microscope with a 9fold magnification. The resolving power amounts
to 20 Å. There are 3 figures and 3 Soviet references.

Card 2/2

AUTHOR: Vorob'yev, Yu. V.   SOV/48-23-6-7/28

TITLE: On the Limit of the Resolution Power of Emission Electron
               Microscopes (O predel'noy razreshayushchcy sposobnosti emission-
               nogo elektronnogo mikroskopa)

PERIODICAL: Izvestiya Akademii nauk SSSR. Seriya fizicheskaya, 1959, Vol 23,
               Nr 6, pp 694 - 696 (USSR)

ABSTRACT: In the introduction, a formula is written down for the theoreti-
               cal resolving power of the immersion objective lens: $\delta = k\varepsilon/E$;
               the proportional counter k, the amount of which depends on the
               character of the emission and the emitted surface, is given as
               amounting to 0.1 - 0.3. The increase of the resolving power
               is connected with an increase of the electrode voltage, and as
               in the latter spark discharges are liable to occur, a practical
               limit is set. A diaphragm facilitates increase of resolving
               power in spite of this limit. In the present paper the author
               shows that the resolving power may be increased by means of an
               electronic mirror, which is used as a filter. The optical scheme
               of this arrangement is shown by figure 1. The number of electrons
               emitted by a thermocathode is calculated by means of the Max-
Card 1/2   well-Boltzmann statistics. As the electron beam emitted from

On the Limit of the Resolution Power of Emission   SOV/48-23-6-7/28
Electron Microscopes

a certain surface element of the cathode fills a certain surface
element of the image, the resolving power is connected with
the current density in the image. Further, the potential on the
mirror influences the resolving power and the intensity of the
image. By means of the formula for the distance from the
symmetry axis of the electrons coming from the center of the
cathode, a formula is then deduced for the current in the image
plane. There are 2 figures and 3 references, 1 of which is
Soviet.

Card 2/2

AUTHORS: Malakhov, L. N., Vorob'yev, Yu. V.   SOV/48-23-6-24/28

TITLE: The Exactness of the Transmission of the Distribution of the
             Potential in Shadow-electron-optical Methods (Tochnost'
             peredachi raspredeleniya potentsiala tenevym
             elektronnoopticheskim metodom)

ABSTRACT: In the shadow-electron-optical method of investigating electro-
             magnetic fields in the neighborhood and on the surface of
             objects, the shadow image of a net is used, which is located
             in the focal plane of the object. A problem to be solved is
             the explanation of the results found and the determination
             of the field from the displacement of the shadow image of
             the net. In the first part of the paper the connection
             between the diffraction of the electrons in the field of the
             object and the displacement of the shadow image of the net
             is investigated. A scheme (Fig 1) is used as a basis for this
             purpose, and a formula (1) is deduced for the displacement.
             In the second part of the paper the determination of the
             electric field near the object is discussed. Two formulas

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The Exactness of the Transmission of the   SOV/48-23-5-24/28
Distribution of the Potential in Shadow-electron-optical Methods

(4) and (5) are deduced for the distribution of the potential,
and the result obtained is shown by two diagrams (Figs 3, 5).
Finally, the exactness of this method is investigated and the
conditions are given at which the distribution of the
potential on the object can be determined. There are
6 figures and 3 references.

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9(6)
AUTHORS: Malakhov, L.N.; Vorot'yev, Yu.V.

TITLE: An Electron-optical Method for the Investigation of Microfields
             (Elektronno-opticheskiy metod issledovaniya mikropoley)

PERIODICAL: Doklady Akademii nauk SSSR, 1959, Vol 125, Nr 2, pp 315 - 316 (USSR)

ABSTRACT: The present paper deals with an electron-optical method for the
             investigation and measurement of the potential distribution in
             the microranges on the surface of a semiconductor. For this purpose,
             the wedge-shaped test object is produced in such a manner that
             its conductivity varies along the edge. This test object is then
             fixed in the object-plane of the lens, where it is irradiated by
             means of a parallel electron beam. The image of the edge of the
             object is then observed on a screen. When a voltage is applied
             to the object, the electric field distorts the electron orbits,
             but because the object is located on the object-plane of the lens,
             its image on the screen remains unchanged. If, while the lens
             and the screen remain in the same position, the focal distance of
             the lens is altered, the image of the object is shifted on the
             screen after a voltage is applied, and its shape is distorted
             according to the deflection angles of the electrons in the field
             of the object. This deflection takes place parallel and
             perpendicular to the edge of the wedge. Shifting of the edge of

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An Electron-optical Method for the Investigation of Microfields

the object in the direction which is perpendicular to this edge
is proportional to the electric field at this point. A formula
for this shift is written down. Shifting in a direction parallel
to the edge of the object is, like in the case of a perpendicular
shift, proportional to the variation Δf of the focal distance of the
lens, but it is of a more complicated character. These shifts can
be avoided by using a lens with adjustable axial astigmatism.
Such tests were carried out on an electronic microscope with
adjustable stigmator, in which case an extended p-n-transition
with a germanium monocrystal was used as experimental object. The
results obtained by this experiment are illustrated by 3 figures.
The results obtained by the present investigation are well confirmed
by measurements carried out by the condenser method.

There are 2 figures.

ASSOCIATION: Fizicheskiy institut im P.N. Lebedeva Akademii nauk SSSR
(Physics Institute imeni P.N. Lebedev of the Academy of Sciences USSR)

PRESENTED: December 7, 1958, by A.A. Lebedev, Academician
SUBMITTED: November 26, 1958.
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9 (7)
AUTHORS: Vorob'yev, Yu. V., Vyazigin, A. A.   SOV/20-126-6-28/67

TITLE: On the Chromatic Aberration Field in the Electron Microscope
(O polevykh khromaticheskikh aberratsiyakh v elektronnom
mikroskope)

PERIODICAL: Doklady Akademii nauk SSSR, 1959, Vol 126, Nr 6, pp 1248 - 1249
(USSR)

ABSTRACT: Earlier papers (Refs 1 and 2) had shown that the chromatic ab-
erration field may be corrected by an appropriate choice of
current strength and voltage in the electron microscope lenses.
The present paper deals with the investigation of the chromatic
aberration field of an electron microscope, in which the axes
of the lenses are individually displaced with respect to one
another. Formulas (1) give the displacement of the image of
any arbitrary object point by a change in the accelerating
voltage by ΔU. Formula (2) serves for the determination of
the section of the total chromatic aberration field in the ax-
ial optical system, and formula (3) the same for nonaxial op-
tical systems. In the case of electron microscopes with high
resolving power, however, chromatic aberration is very slight,
and therefore, a correction is not necessary. It is further

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On the Chromatic Aberration Field in the Electron   SOV/20-126-6-28/67
Microscope

> stated that the chromatic aberration may, in consequence of
> bad collimation, be decreased only by a better collimation and
> a steadier accelerating voltage. There are 2 references.

PRESENTED: March 23, 1959, by A. A. Lebedev, Academician

SUBMITTED: March 16, 1959

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VOROB'YEV, Yu.V.

Analysis of methods for adjusting magnetic electron microscopes.
Opt. i spektr. 10 no.2:257-264 F '61.   (MIRA 14:2)
(Electron microscope)

S/051/61/010/001/012/017
E201/E491

AUTHORS: Vertsner, V.N. and Vorob'yev, Yu.V.

TITLE: Field Chromatic Aberrations in an Electron Microscope

PERIODICAL: Optika i spektroskopiya, 1961, Vol.10, No.1, pp.120-126

TEXT: Morito (Ref.1) and Kanaya (Ref.2) were the first to study field chromatic aberrations (aberrations of magnification and rotation) in electron microscopes. These two workers used approximate representations of magnetic fields by bell-shaped curves, because the recent work on magnetic lenses was not yet available.   Since some workers are of the opinion that such approximate representation may not be a faithful picture of experimental conditions, the present authors decided to calculate field chromatic aberrations anew, using the recent work on magnetic lenses.   The calculations are reported together with experimental studies of the magnification and rotation aberrations in an electron microscope ЭМ-3 (EM-3).   Gold-shadowed diffraction-grating replicas were used as objects and conditions for minimization of the magnification and rotation

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E201/E491

Field Chromatic Aberrations in an Electron Microscope

aberrations were found.   There are 7 figures and 3 non-Soviet references.

SUBMITTED: March 25, 1960

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VOROB'YEV, Yu.V.

Analysis of aberrations appearing due to defects in the manufacture
and alignment of electron microscopes. Radiotekh. i elektron 6
no.8:1386-1391 Ag '61.   (MIRA 14:7)

(Electron microscope)

VERTSNER, V.N.; VORONA, Yu.M.; VOROB'YEV, Yu.V.; BOGDANOVSKIY, G.A.;
CHENTSOV, Yu.V.

Optics of EM-5 and EM-7 electron microscopes. Izv.AN SSSR.Ser.fiz.
25 no.6:680-682 Je '61.   (MIRA 14:6)
                        (Electron microscope)

VYAZIGIN, A.A.; VOROB'YEV, Yu.V.

      Phase contrast and maximum resolving power of an electron micro-
scope. Izv. AN SSSR. Ser. fiz. 27 no.9:1122-1126 S '63.
                                  (MIRA 16:9)

                 (Electron microscope)

VERTSNER, V.N.; IVANOV, M.G.; VORONA, Yu.M.; NIKIFOROVA, V.G.; VOROB'YEV, Yu.V.;
KLYUKIN, V.Ye.

EM-7 electron microscope. Izv. AN SSSR. Ser. fiz. 27 no.9:1193-
1195 S '63.   (MIRA 16:9)
                    (Electron microscope)

VOROB'YEV, Yu.V. (Leningrad)

Random iterative process. Zhur. vych. mat. i mat. fiz. 4 no.6:
1088-1093 N-D '64.
(MIRA 18:2)

L 36549-66   EWT(1)   IJP(c)

ACC NR: AP6015752   (A, N)

SOURCE CODE: UR/0048/66/030/005/0730/0734

AUTHOR: Vyazigin, A. A.; Vorob'yev, Yu. V.

ORG: none

TITLE: Influence of aberrations on image quality under conditions for realizing the ultimate resolution of an electron microscope /Report, Fifth All-Union Conference on Electron Microscopy held in Sumy 6-8 July 1965/

SOURCE: AN SSSR. Izvestiya. Seriya fizicheskaya, v. 30, no. 5, 1966, 730-734

TOPIC TAGS: electron optics, electron microscope, spherical aberration, astigmatism, chromatic aberration, image contrast, optic resolution

ABSTRACT: It has previously been shown by the authors (Izv.AN SSSR. Ser. fiz. 27, 1122 (1063)) that the ultimate resolution of an electron microscope can be improved only by reducing the spherical error or increasing the accelerating potential. In the present paper the authors use the methods and results of their earlier paper to calculate the effects of axial astigmatism, defocusing, and chromatic error on the image contrast and resolution of an electron microscope. The results are presented graphically and in tabular form and are discussed. It is found that image contrast deteriorates more rapidly than resolving power with increasing axial astigmatism or defocusing. If one decreases the spherical aberration, the chromatic aberration de-

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ACC NR: AP6015752

creases also. It is concluded that it is not necessary to improve the stability of the power supplied of modern first class electron microscopes in order to realize the improved resolution that might be made possible by a decrease of their spherical aberrations. Orig. art. has: 13 formulas, 4 figures, and 3 tables.

SUB CODE: 20/   SUBM DATE: 00/   ORIG REF: 001/   OTH REF: 001

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89289

S/181/61/003/001/028/042
B102/B204

9,4160 (also 1137, 1395)

AUTHORS: Vorob'yev, Yu. V. and Karkhanin, Yu. I.

TITLE: Infrared luminescence of the surface layer of cuprous oxide

PERIODICAL: Fizika tverdogo tela, v. 3, no. 1, 1961, 206-211

TEXT: Karkhanin, together with others, carried out various studies on luminescent Cu_2O, and reported on these investigations in earlier paper (Refs.1,2). An investigation of the effect of electrolytes upon Cu_2O luminescence showed that the extinction of luminescence is related to the presence of positive ions on the Cu_2O surface. The opinion was expressed that the cations increase the blocking inflection of the bands in the surface layer of the semiconductor; here, the number of neutral acceptor centers decreases, and thus also the exciton annihilation probability. For specimens with a small screening depth, the diffusion length of an exciton was calculated as being $l_D \approx 5\mu$. It could also be shown that an external electric field may produce a considerable effect

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upon the extinguishing effect of the electrolyte. In continuation of
these studies, the dependence of the intensity of the luminescence of
Cu_2O upon a potential difference applied to the system cuprous oxide -
electrolyte was studied, and a report is given in the present paper.
Fig. 1 schematically shows the optical arrangement of experiments. The
light from source S (100 w) was made parallel in the capacitor lens I,
fell through a filter M (80 mm, concentrated Mohr salt solution), an
interference filter ИФ, which monochromatized the light (filters with
λ_{max} = 442.2, 471.2, and 483.9 mμ were used), and was directed onto the
specimen by means of lens II and prism П so that it hit the interface
electrolyte - Cu_2O from below through the electrolyte. As receiver of
the infrared emission of Cu_2O, a multiplier of the type ФЭУ-22 (FEU-22)
was used; a galvanometer of the type M-21 (M-21) was inserted into the
anode circuit of the FEU-22 photomultiplier. Between specimen and
FEU-22 there was an ebonite filter Ф. Fig.2 shows the arrangement of
specimen and electrolyte. Measurements were carried out in the following
manner: First, the luminescence of dry Cu_2O was measured, and also the

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capacitor photoeffect. Next, the specimen was put into the holder (Fig. 2), and luminescence was measured at various voltages applied to Cu_2O and Pt.

From the preliminary investigations it had already been known that Na_2CO_3 and Na_2SO_4 have a considerable extinguishing power, NaCl and KCl, however, hardly at all. The experiments described were carried out with Na_2CO_3 and NaCl. The dependence of the luminescence intensity on the external voltage was found to differ for the two electrolytes. Whereas in Na_2CO_3, at about 2.5 v, the intensity decrease becomes less with increasing voltage, a jump-like intensity drop occurs in NaCl at about 2.5 v. [Abstracter's note: The present paper shows curves for specimens no. 1-A-1, 1-A-10, and 1-A-17, it is not said in what these specimens differ]. The luminescence intensity decreases if Cu_2O is connected as a cathode; if Cu_2O is the anode, extinction decreases if Na_2CO_3 serves as an electrolyte, it remains unchanged if NaCl is used. Measurements with an alternating-current bridge showed that the Cu_2O electrode has a capacity of 0.005 $\mu f/cm^2$. Experimen-

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Infrared luminescence of the...

tal results indicate that the energy band boundaries on the semiconductor surface in the blocking direction are practically shifted by the amount of the applied external voltage. Here it is assumed that the possible gap between Cu_2O and electrolyte is essentially smaller than the screening depth l_e ($\approx 5\mu$). On the assumption that the band curvature is low, W may be put equal to $W_0 e^{-\mathcal{X}x}$, and for the intensity of luminescence,

$$I_1 = \beta \int_0^\infty n(x)m_\infty \, dx - \beta \int_0^\infty n(x)m_{-\infty}W_0 e^{-\mathcal{X}x}dx - \beta \int_0^\infty n(x)m_{-\infty}(W_0^2/2)e^{-2\mathcal{X}x}dx - \ldots$$

$= I_0 - I_1 W_0 - I_2(W_0^2/2)$ is obtained, where $I_0 = \beta(A/Dp^2)m_\infty$, $\mathcal{X} = 1/l_e$, $W = eV/kT$, $p^2 = 1/D\tau$. Here, the diffusion equation $j = -Ddn/dx$ and the equation of continuity $dj/dx = Ake^{-kx} - n/\tau$ were assumed to hold; $j(x)$ is the exciton diffusion current, $n(x)$ - exciton concentration, τ - exciton lifetime, k - light absorption coefficient. The coefficient $C = (I_1/I_0)(e/kT)$ may be calculated from the $I_1/I_0(V)$ curves:

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Infrared luminescence of the...

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$C = \frac{kp}{k+p} \frac{k + p + \varkappa}{(k+\varkappa)(p+\varkappa)} \frac{m_{-\infty}}{m_{\infty}} \frac{e}{kT}$. From this formula it follows, e.g., for

$m_{-\infty}/m_{\infty} = 0.01$ $p \simeq 0.15$ μ^{-1} and therefrom $l_D \approx 6\mu$, which is in good agree-
ment with previous measurements. The effect of the field upon the
extinction of Cu_2O luminescence may be explained both qualitatively and
quantitatively by assuming that on the surface of the semiconductor a
blocking inflection of the energy bands occurs. The authors thank
Professor V. I. Lyashenko and Docent K. B. Tolpygo for their interest and
discussions. There are 4 figures and 4 Soviet-bloc references.

ASSOCIATION: Kiyevskiy gosudarstvennyy universitet im. T. G. Shevchenko
(Kiev State University imeni T. G. Shevchenko)

SUBMITTED: July 2, 1960

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S/181/62/004/011/043/049
B108/B186

24.3500
26.2420

AUTHORS: Vorob'yev, Yu. V., and Karkhanin, Yu. I.

TITLE: The effect of oxygen vacancies on the luminescence and
             photoconductivity of cuprous oxide

PERIODICAL: Fizika tverdogo tela, v. 4, no. 11, 1962, 3336-3337

TEXT: The long-time component of photoconductivity and the short-wave
(0.7-0.8 µ) luminescence of Cu_2O may be related to donor-type lattice
defects (oxygen vacancies) in the lower half of the forbidden band. These
furnish two electrons which may constitute a center of thermal excitation
in the conduction band or of recombination for a free hole. The variation
of the luminescence intensity with the wavelength of the exciting light
(two maxima) indicates that the centers are excited by the direct absorp-
tion of light. The oxygen vacancies with their two localized electrons
have a short time of afterglow (less than $4 \cdot 10^{-8}$ sec) similarly to the
F-centers in alkali halides. The long-time photoconductivity (I. S.
Gorban' et al., FTT, 3, 7, 1961) in Cu_2O specimens having short-wave

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The effect of oxygen vacancies ...

S/181/62/004/011/043/049
B108/B186

luminescence can therefore be explained by ionized oxygen vacancies trapping free electrons and thus increasing the lifetime of the photoholes. There is 1 figure.

ASSOCIATION: Kiyevskiy gosudarstvennyy universitet im. T. G. Shevchenko
                 (Kiyev State University imeni T. G. Shevchenko)

SUBMITTED: July 9, 1962

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S/051/62/013/001/018/019
39696
E039/E420

24.3500

AUTHORS: Karkhanin, Yu.I., Vorob'yev, Yu.V.

TITLE: On the relaxation time of the short wavelength
             luminescence bands of Cu$_2$O

PERIODICAL: Optika i spektroskopiya, v.13, no.1, 1962, 148

TEXT: Luminescence was excited by a pulsed light source (quartz
high pressure xenon lamp).   A condenser (0.05 µF, 4 kV) was
discharged through the lamp giving a pulse of duration 1.5 µ sec
with a rise time of 0.4 µ sec and a repetition frequency of 50 c/s.
The red and infrared part of the spectrum was absorbed in a
saturated salt solution filter 200 mm thick plus a C3C-17 (SZS-17)
filter.   Detection of luminescence was by means of a. ФЭУ -22
(FEU-22) photomultiplier with a УФС-3 (UFS-3) filter.   Times of
relaxation τ were measured by Tolstoy and Feofilov's *taameter
method which in this case had a limiting sensitivity of 4 x 10^{-8} sec.
At the temperature of liquid oxygen τ is below this limit and
remains so as the temperature is increased to -130°C while the
intensity of luminescence falls quickly.   At temperatures from

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 * taumeter

On the relaxation time ...   S/051/62/013/001/018/019
                                           E039/E420

-183 up to +20°C, τ increases from 6 x 10^{-8} to 5 x 10^{-7} sec
as in N. A. Tolstoy's work.   These results show that the
relaxation time for short wavelength luminescences is less than
for infrared.

SUBMITTED: March 5, 1962

Card 2/2

SOURCE: Fizika tverdogo tela, v. 5, no. 6, 1963, 1589-1594

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ACCESSION NR: AP3001276

This contradicts the existing view concerning the mechanism of photoconductivity in cuprous oxide, a view that the latter time should be much greater. The a

me... sciences, for an discussion on the question of the ... in the ph... and mate-

A ... of severely ... univeraitet im. T.?. Shevchenko (Kiev State University)

SUBMITTED: 11Jan63   DATE ACQ: 01Jul63   ENCL: CO

SUB CODE:

Card 2/2

VOROB'YEV, Yu.V., [Vorobiov, IU.V.]; KARKHANIN, Yu.I.

Kinetics of the infrared luminescence of copper oxide. Ukr.
fiz. zhur. 8 no.7:801-803 Jl '63.   (MIRA 16:8)

1. Kiyevskiy gosudarstvennyy universitet im. Shevchenko.
        (Copper oxide)   (Luminescence)

VOROB'YEV, Yu.V.; KARKHANIN, Yu.I.

Mechanism of the excitation of luminescence of cuprous oxide
in the region of impurity absorption. Opt. i spektr. 15
no.3:389-393 S '63.   (MIRA 16:10)

KARKHANIN, Yu.I.; VOROB'YEV, Yu.V.

Mechanism and kinetics of the electroluminescence of silver
oxide. Dokl. AN SSSR 152 no.4:855-857 O '63.   (MIRA 16:11)

1. Kiyevskiy gosudarstvennyy universitet im. T.G. Shevchenko.
Predstavleno akademikom A.N. Tereninym.

VOROB'YEV, Yu.V.

     Nonlinear photoconductivity of copper oxide. Fiz. tver. tela
     6 no.6:1773-1780, Jo '64.   (MIRA 17:9)

     1. Kiyevskiy gosudarstvennyy universitet imeni Shevchenko.

S/0181/64/006/006/1773/1780

ACCESSION NR: AP4039668

AUTHOR: Vorob'yev, Yu. V.

TITLE: A study of nonlinear photoconductivity of cuprous oxide

SOURCE: Fizika tverdogo tela, v. 6, no. 6, 1964, 1773-1780

TOPIC TAGS: cuprous oxide, nonlinear photoconductivity, recombination center, Fermi level, photoconductivity, semiconductor photoconductivity, capture cross section, energy level, light absorption, photocurrent carrier

ABSTRACT: Previous experiments established that photoconductivity in Cu_2O decayed nonlinearly with two long-term exponential components (characteristic time $\sim 10^{-2}$ and $\sim 10^{-3}$ sec) and two shorter linear components. The accepted explanation for the nonlinearity was the action of light on the lifetime of the photocurrent carriers. This would require the nonlinearity to be limited to an illumination spectrum (0.63 - 0.8 micron), and negative photoconductivity would result from light impulses. Neither effect was observed in the experiments, and the results (see Fig. 1 on the Enclosures) show the change in t was determined by the amount of absorption of light quanta in the sample and was independent of λ (temperature -30 to +200). Nonlinearity was attributed to the change of the

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ACCESSION NR: AP4039668

total cross section of the recombination centers. A model (see Fig. 2 on the Enclosures) applicable to the Cu_2O, had rapid R levels (copper vacancies) and had two slow levels, M_1 and M_2 (oxygen vacancies). Free centers (R, M_1, M_2) captured electrons from the conduction zone (captured probability β, β_1, β_2). The photoelectron occupied center (concentration r, m_1, m_2) captured holes from the valence zone (capture speed T, T_1, T_2). The probability of carrier capture by a center, per unit time, is linked to the capture cross section S by $\beta_i = vS_i$ where v is the thermal speed. The center concentration decayed exponentially. Experimental results showed the long-term concentrations, m_1, m_2, differed only by a constant factor, and their ratio $\frac{m_{01}}{m_{02}}$ was independent of the illumination, the conditions for which show: 1) the filling of the centers is linked with the spacing of their Fermi energy levels; and 2) the energy position of the M_1 and M_2 levels is the same. Light absorption occurs in two bands, basic ($\lambda < 0.63\mu$) and an additional band ($\lambda 0.7-0.8$) with differing photoconductive processes in each. The discharge of the long components is maximum, with $\lambda > 0.65\mu$; and the short components with $\lambda < 0.63\mu$. The parameters of the recombination centers of the M_1 and M_2 levels were determined, and the energy spacing of the R centers was found

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ACCESSION NR: AP4039668

from the Fermi level. Study of the nonlinearity of photoconductivity permits the simple determination of the recombination center parameters in a semiconductor when the recombination center concentrations are small in comparison with the concentration of the basic current carriers. The author thanks Yu. I. Karkhanin for his interest in the work. Orig. art. has: 1 table, 3 figures, and 20 equations.

ASSOCIATION: Kiyevskiy gosudarstvennyy universitet im. T. G. Shevchenko (Kiev State University)

SUBMITTED: 17Sep63

SUB CODE: SS

NO REF SOV: 008

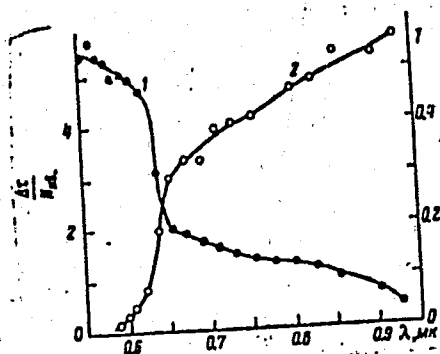ENCL: 02

OTHER: 004

Card 3/5

ACCESSION NR: AP4039668

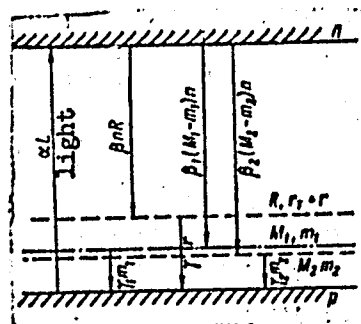Fig. 1. Spectral dependence of transmission T (2) and effect of illumination on t (1).

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Fig. 2. Scheme of electron transitions.

L 2515-66   EWT(1)/EWT(m)/EWP(j)/T   LJP(c)   GG/RM

ACCESSION NR: AP5014593

UR/0181/65/007/006/1865/1870

AUTHOR: Vorob'yev, Yu. V.; Karkhanin, Yu. I.

TITLE: Investigation of the photoconductivity of cuprous oxide in the temperature interval +20 — +1500

SOURCE: Fizika tverdogo tela, v. 7, no. 6, 1965, 1865-1870

TOPIC TAGS: photoconductivity, cuprous oxide, crystal lattice defect, electron capture

ABSTRACT: In view of certain contradictions in the published explanations of the nature of photoconductivity of cuprous oxide, the authors investigated the action of various factors that changed the concentration of the complexes (changes in temperature and illumination) on the low-inertia photoconductivity (with time constant $< 10^{-4}$ sec), and the influence of prolonged illumination on the conductivity of cuprous oxide. The photoconductivity was excited with short light pulses (~ 1.5 µsec, $\lambda = 0.7 - 0.8$ µ). In the $20 < T < 700$ range, only the electronic was observed, but at $T > 700$ a hole component appeared, exponentially damped with a proper time on the order of 10^{-4} sec. The yield of this component increased

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ACCESSION NR: AP5014593

6

rapidly with increasing temperature. The hole component, like the electronic component, was found to be sensitive to constant illumination, and the increase in the sample conductivity upon illumination was accompanied by an appreciable decrease of photocurrent yield. These results are related to processes of association and dissociation of complexes of defects of the crystal lattice. It is indicated that complexes of Cu vacancies participate in the photoconductivity of Cu_2O by serving as metastable traps when $T > 1000$. The cross sections for the capture of electrons by the Cu vacancies and by their complexes are estimated. "The authors thank 0, 6, Zinots for a valuable discussion". Orig. art. has: 7 formulas and 5 figures.

ASSOCIATION: Kiyevskiy gosudarstvennyy universitet im. T. G. Shevchenko (Kiev State University) 44/65

SUBMITTED: 04May64   ENCL: 00   SUB CODE: SS,OP

NR REF SOV: 008   OTHER: 007

Card 2/2

KOMISSAROV, P.F.; VOROB'YEV, Yu.V.; VYAKHIREV, D.A.

Effect of pressure on the effectiveness and sensitivity of chromato-
graphic analysis in the gaseous phase. Trudy po khim.i khim.tekh.
no.1:102-105 '63.   (MIRA 17:12)

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VOROB'YEV, Yu.Yu.; IVANKIN, P.F., otv. red.; KROTOVA, I.Ye.,
red.izd-va; IYERUSALIMSKAYA, Ye., tekhn. red.

[Geologic and genetic characteristics and zoning of the
Irtysh complex metal deposit in the Altai] Geologo-
geneticheskie i zonal'nost' irtyshskogo polimetallicheskogo
mestorozhdeniia na Altae. Moskva, Gosgeoltekhizdat, 1963.
125 p.   (MIRA 16:5)
        (Altai Mountains—Ore deposits)

VOROB'YEV, Yu.Yu.

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zones of the Borezovo-Belousovka ore field. Trudy Alt.GMNII AN
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Relationship between the hydrothermal metamorphism and sulfide mineralization in the Berezovskiy-Belousovskiy ore region. Trudy Alt.GMNII AN Kazakh.SSR 8:126-145 '60.
(MIRA 13:7)

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(Metamorphism(Geology))

VOROB'YEV, Yu.Yu.; IVANKIN, P.F., otv. red.; KROTOVA, I.Ye., red.
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[Geologic and genetic characteristics and zoning of the
Irtysh complex metal deposit in the Altai] Geologo-
geneticheskie osobennosti i zonal'nost' Irtyshskogo polime-
tallicheskogo mestorozhdeniia na Altae. Moskva, Gosgeol-
tekhizdat, 1963. 125 p.   (MIRA 16:6)
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VOLKOV, V.M.; VOROB'YEV, Yu.Yu.; IVANKIN, P.F.; STUCHEVSKIY, N.I.

Experience and methods of large-scale prediction in the Berezovo-Belousovka ore deposit. Trudy Alt.GMNII AN Kazakh.SSR 12:37-48

'62.   (MIRA 15:8)

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